WE CLAIM:

1. A system for detecting transverse cracks in rail head on railway track comprising:

a transporter on the railway track, said transporter moving the system along the railway track,

a toroidal-shaped DC magnet mounted to the transporter with its opposing pole ends inwardly directed towards each other and aligned over the rail head,

an inductive coupling between each of the poles and the rail head to magnetically saturate the rail head, the inductive coupling slideably engaging the rail head,

at least one low frequency eddy current probe, centrally located between the poles of the toroidal-shaped DC magnet, for sensing said transverse cracks in the rail head,

protective material on the low frequency eddy current probe,

a carriage mounted to the transporter forcing said low frequency eddy current probe against said rail head, the protective material abutting the rail head when the transporter moves on the railway track thereby protecting the low frequency eddy current probe from damage.

2. The system of claim 1 further comprising:

one or a plurality of supports on said carriage engaging the rail head for controlling lift-off of the low frequency eddy current probe from the rail head.

3. The system of claim 2 wherein said one of a plurality of supports are wheels.

4. The system of claim 1 wherein the toroidal-shaped DC magnet has four layers of windings extending down towards the opposing ends.

5. The system of claim 1 wherein the inductive coupling comprises a plurality of carbon steel bristles mounted to each of the pole ends.

6. The system of claim 1 wherein the low frequency eddy current probe is an air core coil.

7. The system of claim 1 wherein the protective material is TEFLON.

8. The system of claim 1 wherein the carriage comprises two spring-loaded supports.

9. The system of claim 1 wherein the plurality of wheels is four.

10. The system of claim 1 wherein the carriage orients the low frequency eddy current probe off the center of the rail.

11. The system of claim 1 further comprising:

a separate sensor near said low frequency eddy current probe for sensing non-relevant indications in the rail head, said separate sensor held a predetermined distance above said rail head,

said system rejecting a sensed transverse crack when the separate sensor senses a non-relevant indication.

12. The system of claim 11 wherein the separate sensor is a Hall element sensor.

13. The system of claim 1 wherein the at least one probe is one probe, the aforesaid one probe centered over the centerline of the rail head.

14. The system of claim 1 wherein the at least one probe is a plurality of probes, each of the aforesaid plurality probes located across the rail head.

15. A system for detecting transverse cracks in rail head on railway track comprising:

a transporter on the railway track, said transporter moving the system along the railway track,

a DC magnet mounted to the transporter with its opposing pole ends aligned over the rail head,

an inductive coupling between each of the poles and the rail head to magnetically saturate the rail head, the inductive coupling slideably engaging the rail head,

at least one low frequency eddy current probe, centrally located between the poles of the DC magnet, for sensing said transverse cracks in the rail head,

a carriage mounted to the transporter forcing said low frequency eddy current probe towards said rail head,

one or a plurality of supports on said carriage engaging the rail head for controlling lift-off of the low frequency eddy current probe from the rail head.

16. ~~A system for detecting~~ transverse cracks in rail head on railway track comprising:

a transporter on the railway track, said transporter moving the system along the railway track,

a DC magnet mounted to the transporter with its opposing pole ends aligned over the rail head,

an inductive coupling between each of the poles and the rail head to magnetically saturate the rail head, the inductive coupling slideably engaging the rail head,

at least one low frequency eddy current probe, centrally located between the poles of the DC magnet and over said rail head, for sensing said transverse cracks in the rail head,

a separate sensor near said low frequency eddy current probe for sensing non-relevant indications in the rail head, said separate sensor held a predetermined distance above said rail head,

said system rejecting a sensed transverse crack from the low frequency eddy current probe in an area of the rail head when the separate sensor senses a non-relevant indication at said area.

17. A system for detecting transverse cracks in rail head of a rail, said system comprising:

means on the rail for transporting the system,

means for moving the transporting means on the rail,

a DC saturation magnet mounted to the transporting means a predetermined distance above the rail head, the saturation magnet having a toroidal-shape with opposing pole ends inwardly directed towards each other over the rail head, the saturation magnet generating a saturation magnetic field into and across the rail head,

means affixed to the opposing pole ends for inductively coupling the saturation magnetic field with the rail head, the inductively coupling means slideably engaging the rail head,

a low frequency eddy current probe,

means mounted to the transporter means for carrying the low frequency eddy current probe centrally between the opposing pole ends of the saturation magnetic and over the rail head,

means for applying a force to the carrying means towards the rail head as the transporting means moves on the rail so as to minimize lift-off of the low frequency eddy current probe from the rail head.

18. A method for detecting transverse cracks in rail head of a rail comprising:

moving a transporter on the rail,

generating a saturation magnetic field into and across the rail head with a DC saturation magnet mounted to the transporter a predetermined distance above the rail head while the transporter is moving, the saturation magnet having a toroidal-shape with opposing pole ends inwardly directed towards each other over the rail head,

inductively coupling the opposing pole ends of the DC saturation magnet with the rail head,

detecting transverse cracks in the rail head with a low frequency eddy current probe mounted centrally between the opposing pole ends of the DC saturation magnetic and over the rail head,

applying a force to the low frequency eddy current probe against the rail head as the transporter moves on the rail,

controlling lift-off of the low frequency eddy current probe from the rail head as the transporter moves on the rail.

19. The method of claim 18 further comprising:

sensing non-relevant indications in the rail head with at least one separate sensor,

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rejecting a detected transverse crack by the low frequency eddy current probe when it corresponds to a sensed non-relevant indication by the at least one separate sensor.

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20. A method for detecting a transverse crack in rail head of a rail comprising:

moving a transporter on the rail,

generating a saturation magnetic field into and across the rail head with a DC saturation magnet mounted to the transporter a predetermined distance above the rail head while the transporter is moving,

inductively coupling the opposing pole ends of the DC saturation magnet with the rail head,

detecting a possible transverse crack in an area of the rail head with a low frequency eddy current probe mounted centrally between the opposing pole ends of the DC saturation magnetic and over said area of the rail head,

sensing a non-relevant indication in said area of the rail head with at least one separate sensor,

rejecting said possible detected transverse crack by the low frequency eddy current probe only when said a non-relevant indication is sensed by the at least one separate sensor for said area.